TABLE 2.—*Free-air Resultant Winds (m. p. s.) during February, 1922.*

Altitude. M. S. L. m.	Broken Arrow, Okla. (233m.)				Drexel, Nebr. (396m.)				Due West, S. C. (217m.)		Ellendale, N. Dak. (444m.)				Groesbeck, Tex. (141m.)				Royal Center, Ind. (225m.)			
	Mean.		Normal.		Mean.		Normal.		Mean.		Mean.		Normal.		Mean.		Normal.		Mean.		Normal.	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface	N. 22°E.	1.1	S. 87°W.	0.9	N. 68°W.	2.2	N. 65°W.	1.4	S. 71°W.	1.4	N. 43°W.	5.0	N. 37°W.	2.9	S. 28°W.	1.2	N. 50°W.	0.5	S. 63°W.	2.3	S. 88°W.	2.1
250	N. 24°E.	1.0	S. 69°W.	1.0	.....	.....	.....	.....	S. 78°W.	1.6	.....	.....	.....	.....	S. 24°W.	1.8	N. 68°W.	0.6	S. 68°W.	3.4	S. 83°W.	2.1
500	S. 10°E.	.4	S. 80°W.	1.2	N. 71°W.	3.0	N. 73°W.	2.0	S. 86°W.	3.8	N. 44°W.	5.3	N. 42°W.	3.1	S. 39°W.	2.8	S. 58°W.	1.2	S. 52°W.	4.9	S. 67°W.	3.3
750	S. 5°E.	1.2	S. 62°W.	2.8	N. 80°W.	4.0	N. 71°W.	4.0	S. 85°W.	5.6	N. 47°W.	5.6	N. 50°W.	4.4	S. 36°W.	3.2	S. 58°W.	2.2	S. 65°W.	7.3	S. 64°W.	4.5
1,000	S. 52°W.	1.8	S. 60°W.	4.0	N. 82°W.	5.1	N. 68°W.	5.4	S. 80°W.	7.5	N. 52°W.	6.0	N. 48°W.	5.2	S. 53°W.	4.1	S. 70°W.	3.4	S. 65°W.	9.3	S. 74°W.	5.2
1,250	N. 87°W.	3.0	S. 82°W.	4.5	N. 84°W.	6.9	N. 66°W.	6.6	S. 80°W.	10.2	N. 56°W.	5.9	N. 50°W.	6.4	S. 70°W.	6.9	S. 80°W.	4.3	S. 75°W.	10.1	S. 80°W.	6.9
1,500	N. 86°W.	3.6	S. 87°W.	5.1	N. 78°W.	9.1	N. 67°W.	8.5	S. 76°W.	11.3	N. 62°W.	6.7	N. 58°W.	7.9	S. 74°W.	8.1	S. 88°W.	5.6	S. 81°W.	12.8	S. 81°W.	8.0
2,000	S. 85°W.	6.3	N. 72°W.	7.4	N. 76°W.	11.2	N. 69°W.	10.5	S. 78°W.	14.0	N. 71°W.	9.3	N. 64°W.	9.8	S. 73°W.	11.1	N. 86°W.	7.7	S. 88°W.	15.0	S. 85°W.	9.3
2,500	N. 81°W.	8.1	N. 57°W.	6.1	N. 77°W.	13.2	N. 70°W.	12.4	S. 81°W.	16.1	N. 74°W.	11.4	N. 68°W.	12.4	S. 80°W.	12.0	N. 84°W.	9.2	N. 88°W.	16.8	S. 87°W.	11.7
3,000	S. 88°W.	11.9	N. 77°W.	9.6	N. 84°W.	15.7	N. 73°W.	14.6	S. 84°W.	18.5	N. 83°W.	13.0	N. 70°W.	13.5	S. 79°W.	13.3	W.	11.6	N. 87°W.	20.8	S. 84°W.	12.5
3,500	N. 87°W.	12.4	N. 58°W.	15.0	N. 88°W.	18.2	N. 71°W.	16.0	W.	16.2	N. 78°W.	15.0	N. 72°W.	12.2	S. 54°W.	14.7	N. 82°W.	14.1	N. 84°W.	23.6	S. 89°W.	16.3
4,000	N. 82°W.	9.0	.....	.....	S. 87°W.	18.7	N. 77°W.	15.9	.....	.....	N. 73°W.	14.9	N. 68°W.	12.7	S. 68°W.	20.5	N. 67°W.	12.9	N. 70°W.	23.2	S. 82°W.	17.9
4,500	N. 45°W.	16.5	.....	.....	N. 80°W.	18.0	N. 81°W.	18.5	.....	.....	W.	16.4	N. 64°W.	13.7	.....	.....	N. 77°W.	14.8	N. 67°W.	19.5	.....	.....
5,000	.....	.....	.....	.....	S. 68°W.	18.5	N. 76°W.	19.7	.....	.....	.....	.....	S. 67°W.	18.4	.....	.....	.....	.....	.....	.....	.....	.....

A condition like this one is occasionally, not frequently, observed in summer, when pressure and temperature gradients are weak over extended areas. In this case, however, an anticyclone of great vigor was central a short distance southwest of Ellendale. This position was favorable for the NW. winds that were found in the lower levels. But why the SE. winds above them? Unfortunately only a short kite flight was possible because of light winds. The record showed, however, a marked temperature inversion. On the other hand, there was a fall in temperature with height above Drexel, with the result that, although at the surface the temperature decreased northward, in the free air it decreased southward, thus reversing the normal poleward pressure gradient and consequently producing easterly instead of westerly winds. These easterly winds were general over a considerable portion of the country on this day, but in other places extended down to the surface instead of being underrun by westerly winds. At Drexel, farther removed from the anticyclonic center, ENE. winds were general up to 3,000 meters; above this height there was a sudden shift to WSW.—a direction nearly parallel to the surface isotherms. In this region the poleward temperature gradient was much steeper than it was farther north. NE. winds were observed also at Madison and Broken Arrow up to 2,000 meters; at Camp Lewis, Washington State, up to 4,500 meters; and at San Francisco and Mather Field, Calif., up to 3,000 meters.

THE WEATHER ELEMENTS.

By P. C. DAY, Climatologist and Chief of Division.

PRESSURE AND WINDS.

Changes in atmospheric pressure during the month were frequent but usually not marked, and severe storms or cold waves were mainly of limited extent or duration.

Low areas of the month attended by substantial precipitation and more or less stormy conditions, were confined to a few dates, among which the following stand out most prominently: On the 1st to 3d a storm of wide extent moved from the middle Missouri Valley to the Canadian Maritime Provinces, giving snows over northern districts from the Plateau region to the Great Lakes, and moderate to heavy rains in other portions of the country from the Rocky Mountains eastward. High winds prevailed over the northern plains, reaching blizzard proportions in parts of the Dakotas; on the 14th a storm center developed over the west Gulf and moved rapidly to the northeastward over the Gulf and Atlantic Coast States during the 15th and 16th, giving heavy rains over the central and southern portions of the area, and moderate rains or snows to the northward. On the 21st a low-pressure area moved from the Southwest to the middle plains, and during the following 48 hours extended into the Great Lakes region as a storm of considerable severity. Heavy snows occurred over the regions to northward of the center, heavy rain, snow, and sleet near the center, and rains to the southward. Over the Great Lakes and the northern plains high winds occurred, and in portions of eastern Minnesota, and generally over central Wisconsin and Michigan one of the worst ice storms ever known prevailed. Enormous damage to forests, orchards, and overhead wire systems resulted from the heavy ice coating, and traffic was greatly hindered. A more complete account of this appears on pages 77–82 of this issue.

Stormy conditions prevailed near the close of the month and precipitation was widespread, and in some instances, heavy, over practically all portions of the southern half of the country.

The average pressure for the month was highest over the upper Missouri Valley and the adjacent Canadian Provinces, where it exceeded 30.20 inches, and lowest over the southern portions of the Rocky Mountain and Plateau regions. Compared with the normal it was above in all portions of the United States and the adjacent portions of Canada, save from the central Plateau and Pacific coast regions northward, where it was less than normal.

The principal high winds of the month occurred in connection with the storm of the 21st–23d, particularly during the 23d, over the lower Lakes where maximum velocities of 50 to 80 miles or more per hour were recorded.

The prevailing winds were mainly from the northwest in the Missouri and upper Mississippi Valleys; from southerly points in the Ohio Valley, lower Lakes, and generally over the southeastern States, and variable in other districts.

TEMPERATURE.

The month as a whole was marked by continuous but not severe cold over the upper Missouri Valley, and it was colder than normal over all districts from the Rocky Mountains westward. In portions of Montana and Wyoming the monthly averages were among the lowest of record, the average daily means ranging from 10° to 15° below normal. However, the extreme cold of some other years was not reached.

From the southern plains eastward and northeastward, the average temperatures were above the monthly normals, and in portions of the southeastern States the month was distinctly warm.

The principal cold periods were from the 2d to 5th over the central and southern portions of the Rocky Mountain and Plateau regions; on the 7th and 8th over the Gulf and South Atlantic States; near the middle of the month from the lower Missouri and upper Mississippi Valleys eastward to the Atlantic coast; and near or at the end in the upper Missouri Valley and northern portions of the Plateau.

The lowest temperature observed, −45°, occurred in northern Minnesota, and temperatures of −40°, or slightly lower, were observed in Montana, Wyoming, northern Wisconsin, and northern New England. Minimum temperatures below zero were reported from all the western Mountain States and over all districts eastward save in the Gulf and South Atlantic States, Arkansas, Tennessee, and Kentucky.

In the districts from the Rocky Mountains eastward the principal warm periods were from the 9th to 13th over the Great Plains and most of the Gulf States, and from the 20th to 23d over the middle Mississippi Valley and thence eastward to the Middle Atlantic and New England States.

PRECIPITATION.

The rainfall of the month was generous and usually above normal over the Gulf and South Atlantic States, the total amounts ranging from 4 to 8 inches over a wide area from eastern Texas to southern Virginia. Precipitation was generally above normal in California, the middle Plateau, northern Plains, and Great Lakes region. In portions of the upper Lake region the month was the wettest February in many years, and similar conditions prevailed in portions of California and Nevada.

Precipitation was scanty and usually less than normal in the southern Plateau and Rocky Mountain regions, over the middle and southern Great Plains, from Missouri and Illinois eastward and northeastward to the Atlantic coast, and in the far Northwest.

Over most of these districts the precipitation was sufficient for current needs, except in portions of the Southwest where drought conditions that had prevailed for long periods still continued at the end of the month.

SNOWFALL.

Although individual snowstorms were not widespread in many instances, more or less snow fell during the month over nearly all portions of the country, only the extreme southern portions receiving none.

From the northern Rocky Mountains to the Great Lakes the snowfall on the whole was heavier than usual; in some sections, notably in the vicinity of Lake Superior, the fall was the heaviest ever known in February. There was likewise unusually heavy snow in the mountains of California and Nevada, and generally over the northern and central portions of the western Mountain regions there was more snow than is usual for February.

In the central valleys there was usually but little snow, and the amounts over the eastern districts were near the normal.

There was some interruption to traffic on account of drifting over the north Central States from the snow of the 21st to the 23d, and over Oklahoma and portions of adjacent States, from the storm of the 27th to 28th.

The accumulated snow in the western mountains is generally above normal over the central and northern sections, and the prospects are good for a sufficient supply of water during the coming summer. This is especially the case in California and portions of Nevada and Utah, where the outlook is the best for a number of years. In the southern Mountain sections the amount of stored snow is less than normal, and the outlook for water during the dry season is less encouraging.

RELATIVE HUMIDITY.

In the main the departures of the average relative humidity from the normal outlined the areas of excessive and deficient precipitation, and values above the normal appear in the Gulf and Atlantic Coast States, in the upper Lake region, and thence westward to the Rocky Mountains and over the middle Plateau and the interior and southern portions of California.

In the middle and southern Plains region the negative departures were large, and likewise in the middle Mississippi Valley and parts of the lower Lakes. On the other hand, the positive departures were unusually large in portions of the Carolinas and Georgia and locally in the Lake Superior region, North Dakota, Nevada, and central California.

Severe local storms.

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the annual report of the chief of bureau.]

Place.	Date.	Time.	Width of path.	Loss of life.	Value of property destroyed.	Character of storm.	Remarks.	Authority.
Enterprise, Ala.	5	A. m.	*Yards.* 150-200	1	$25,000-50,000	Tornado	12 persons injured, many dwellings destroyed, and about 40 families homeless. Telephone lines and light poles razed.	Official U. S. Weather Bureau. Advertiser (Montgomery, Ala.).
Garfield, Utah (west of)	9	A. m.				Wind	Damage to box cars and buildings	Official U. S. Weather Bureau. Telegram (Salt Lake City, Utah).
Wytheville, Va., and vicinity.	14-15					Ice and snow	Severe damage to trees, telephone, and telegraph lines.	Official U. S. Weather Bureau.
Lake region	21-23					Ice, snow, and rain	Heavy losses in several States. Traffic, telephone, and light service demoralized. Homes flooded and buildings damaged. High wind at Rochester.	Official U. S. Weather Bureau. Free Press (Detroit, Mich.), Tribune (Chicago, Ill.).